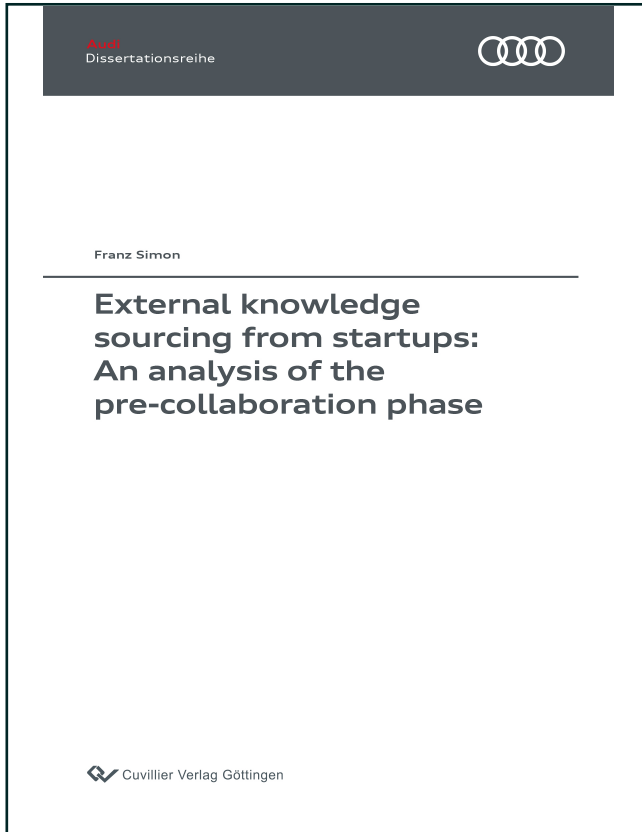




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External knowledge sourcing from startups: An analysis of the pre-collaboration phase



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1.1. Motivation and main research question

Digitalization has increasing impact on product-focused industries such as the automotive industry (Nambisan, 2017; Svahn, Mathiassen, & Lindgren, 2017). The resulting turbulences have forced corporations to respond to emerging technological developments as well as changes in their market environments (Bergek, Berggren, Magnusson, & Hobday, 2013). To remain competitive in such environments, firms need to explore new technological paths and access external knowledge as an extension to internal innovation activities (Criscuolo, Laursen, Reichstein, & Salter, 2018; Laursen & Salter, 2006; Leiponen & Helfat, 2010; Rosenkopf & Nerkar, 2001). External knowledge adds new variations of problem solutions that are unknown to the in-sourcing organization (Fleming & Sorenson, 2001; Katila & Ahuja, 2002; March, 1991). By combining external knowledge with existing routines, firms generate new knowledge (Zollo & Winter, 2002). Thus, continuous creative stimuli from their environment enable firms to generate radically new solutions and to build own innovation capabilities (Colombo, von Krogh, Rossi-Lamastra, & Stephan, 2017; Kogut & Zander, 1992).

Collaborations with customers, suppliers, universities, or even competitors are a promising way to extend the own knowledge base (Van de Vrande, 2013; West & Bogers, 2014). Suppliers have large impact on product innovation, but the knowledge corporate firms need to access cannot always be found within the existing networks of their organizations (Brusoni, Prencipe, & Pavitt, 2001; Schiele, 2006; Un, Cuervo-Cazurra, & Asakawa, 2010). Recently, startups as new knowledge providers have received growing attention (Monteiro & Birkinshaw, 2017; Weiblen & Chesbrough, 2015; Zaremba, Bode, & Wagner, 2017). By engaging in partnerships with startups, firms aim to benefit from startups' entrepreneurial characteristics and knowledge (Audretsch, Segarra, & Teruel, 2014; Criscuolo, Nicolaou, & Salter, 2012; Marion, Friar, & Simpson, 2012).

Startups are newly founded firms younger than six to eight years (Song, Podoyntsyna, Van Der Bij, & Halman, 2008) and are mainly defined by their liability of newness (Stinchcombe, 1965). According to Singh, Tucker, and House (1986, p. 171), “[t]his liability of newness occurs because young organizations have to learn new roles as social actors, coordinate new roles for employees and deal with problems of mutual socialization of participants, and because of both their inability to compete effectively with established organizations and their low levels of legitimacy.” As startups miss assets, they cannot experiment with many different ideas, but have to focus on specific ones (van Burg, Podoyntsyna, Beck, & Lommelen, 2012). Thus, new product development (NPD) is more



focused and dynamic within startups compared to established organizations (Rothaermel, 2002). Further, startups apply customer-centric methods like “design thinking” or “lean startup”, which allow early interaction as well as continuous iterations with customers (Blank, 2013; Weiblen & Chesbrough, 2015). Innovation capabilities are vital for startups to quickly access market shares and early cash flows (Schoonhoven, Eisenhardt, & Lyman, 1990). Due to small firm size, startups can sustain high flexibility and short chains of command (Kickul, Griffiths, Jayaram, & Wagner, 2011; Rothaermel, 2002). Finally, startups possess high willingness to take risks and high growth potential which allows to accomplish a prime position for innovation, especially radical innovation (Criscuolo et al., 2012; Engel, 2011). Overall, startups show distinct differences to established organizations (Brunswick & Hutschek, 2010; Gassmann, Zeschky, Wolff, & Stahl, 2010).

Prior research has focused on how firms can access knowledge from their established suppliers by screening their supply base (Johnsen, 2009; Pulles, Veldman, & Schiele, 2014; Schiele, 2006). In a consecutive step, firms try to achieve a prime position to access supplier knowledge as they aim to become their preferred customer (Hüttinger, Schiele, & Schröer, 2014; Pulles, Schiele, Veldman, & Hüttinger, 2016; Schiele, 2012; Steinle & Schiele, 2008). Yet, the literature misses an analysis on how to access knowledge beyond the established supply base such as knowledge originating startups (Weiblen & Chesbrough, 2015; Zaremba et al., 2017). Concerning the impact of knowledge provided by startups, existing studies show that incorporating their knowledge increases the innovation performance of corporations (Dushnitsky & Lenox, 2006; Wadhwa, Phelps, & Kotha, 2016). Although organizations theory shows that firms rely on external stimuli in their knowledge generation process (Agarwal & Helfat, 2009; Eisenhardt & Martin, 2000), no existing study has considered the effects of implementing structured search for startups. As a consequence, this dissertation focuses on the following primary research question:

Which approaches do corporations follow to access knowledge provided by startups and what are the implications on the organization?

In sum, startups have evolved to an important source of innovation. As it may become essential for corporations to identify knowledge originating startups and to become an attractive partner for startups, this dissertation focuses on the pre-collaboration phase of corporate-startup relationships. The pre-collaboration phase concerns all activities before engaging in



collaborative work or signing formal agreements. Therefore, the present work focuses mainly on the identification of partners and also considers what decides about whether or not firms enter into corporate-startup collaborations.

1.2. Theoretical background

This dissertation builds on external knowledge sourcing literature. External knowledge sourcing is defined as the firms' ability to "*tap into new ideas and technologies from beyond their boundaries*" (Monteiro & Birkinshaw, 2017, p. 342). Thereby, organizations identify new solutions by creating and recombining knowledge across boundaries (Katila & Ahuja, 2002; Rosenkopf & Nerkar, 2001).

Extensive research provides evidence for the positive relationship between openness to external knowledge and firms' innovation performance (Lakemond, Bengtsson, Laursen, & Tell, 2016; Laursen & Salter, 2006; Leiponen & Helfat, 2010; van Wijk, Jansen, & Lyles, 2008; Wadhwa et al., 2016). In addition, the acquisition and application of external knowledge contributes to firms' renewal and extension of their capabilities (Agarwal & Helfat, 2009; Eisenhardt & Martin, 2000). Besides underlining the value of distinct knowledge providers (e.g., suppliers, customers, or universities), the literature has introduced different approaches to access external knowledge. The external sourcing continuum ranges from acquisitions (Ahuja & Katila, 2001; Andersson & Xiao, 2016) and minority investments (Dushnitsky & Lenox, 2006; Wadhwa & Basu, 2013) to strategic alliances (Lavie, 2007; Stuart, 2000).

Theoretically, external knowledge sourcing is closely linked to the knowledge-based view (KBV) of the firm (Grant, 1996b; March, 1991). According to the KBV, knowledge is considered as the most important firm resource (Grant, 1996b; Nickerson & Zenger, 2004; Nonaka, 1994). Hence, firms' existence is primarily grounded on coordinating mechanisms to integrate specialized knowledge (Grant, 1996a; Kogut & Zander, 1992). Further, the KBV claims that "the heterogeneous knowledge bases and capabilities among firms are the main determinants of performance differences" (DeCarolis & Deeds, 1999, p. 954). In other words, the firms' ability to explore, acquire, retain, integrate, and exploit knowledge is central to firms value creation (Grant, 1996b). This is especially valid in knowledge-intensive contexts, such as the high-technology sectors (Bingham & Davis, 2012; Steensma & Corley, 2000).

Especially, startups as an external source of knowledge positively impact the sourcing organizations' innovation performance (Benson & Ziedonis, 2009; Dushnitsky & Lenox, 2006). In order to access knowledge provided by startups, corporations have to consider their specific



needs based on missing organizational routines (Minshall, Mortara, Elia, & Probert, 2008; Minshall, Mortara, Valli, & Probert, 2010; Prashantham & Birkinshaw, 2008). From the perspective of startups, collaborations with corporations imply tensions between value creation and knowledge misappropriation (Diestre & Rajagopalan, 2012; Katila, Rosenberger, & Eisenhardt, 2008). With much more power in the collaboration, corporations can even endanger the survival of startups. Still, smaller firms also benefit from partnerships with corporations as they can access new markets and technologies (H. Chen & Chen, 2002; Kalaignanam, Shankar, & Varadarajan, 2007).

1.3. Focus of this research and methodology

With focus on the pre-collaboration phase of relationships between corporations and startups, this dissertation applies an input-process-output model to study the identification and access of knowledge provided by startups (see Figure 1). “Input” is defined by specific criteria that are inherent to startup and corporate organizations. “Process” describes how organizations interact prior to setting up a collaboration and which organizational approaches are implemented. Finally, “output” defines the implications of initiating corporate-startups collaborations, e.g., organizational learning for the corporation and feedback or reputation for startups.

From the perspective of the sourcing corporation, the quality of startups ideas serves as the “input” for decisions on whether to engage in partnerships with startups and if these relations have the potential to be value-adding for the organization. Consequently, chapter 2 examines the quality of startup ideas. Chapter 3 and 4 show how corporations organize the search for startups and which search strategies are followed. Accordingly, these chapters focus on the “process” of establishing such collaborations. Taking the perspective of startups, chapter 5 investigates how corporations may become attractive partners for startups. By considering resources and assets that can be provided by corporations and taking relational aspects into account, this chapter contributes to all three phases. The following sub-chapters introduce the motivation and background of each chapter, as well as the proposed research questions and methodological approaches.

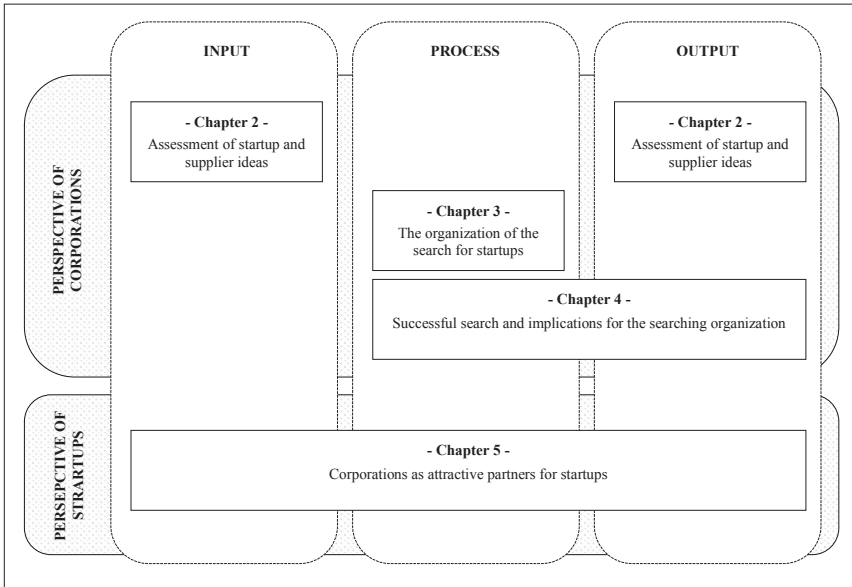


Figure 1: Dissertation outline by an input-process-output model

1.3.1. Assessment of startup and supplier ideas

Suppliers have been broadly regarded as the most influential external partner providing positive effects for a firms' innovative output (Al-Zu'bi & Tsinopoulos, 2012; Lau, Tang, & Yam, 2010; Un et al., 2010; Wagner, 2012; Yenyurt, Henke Jr, & Yalcinkaya, 2014). Yet, not all innovation efforts with suppliers are successful (Koufteros, Vonderembse, & Jayaram, 2005; Song & Thieme, 2009). Thus, firms have begun to tap beyond their established supply base and have started to look for new partners such as startups (Weiblen & Chesbrough, 2015; Zaremba, Bode, & Wagner, 2016; Zaremba et al., 2017). While there are studies on how to integrate startups into the existing supply base (Zaremba et al., 2017) or collaborate in programs (Bergek & Norrman, 2008; Pauwels, Clarysse, Wright, & Van Hove, 2016), an examining how startups actually perform as an external source of innovation misses. Especially, no prior study has investigated the performance of startups in comparison to suppliers in a real-world empirical setting. This is an important research gap as in the long run the results will guide a firm's decision whether or not to invest in the collaboration with startups, which typically involve more effort and uncertainty compared to relationships with established suppliers. Consequently,



the first research question (RQ1) is: *How do startups and established suppliers perform compared to each other in generating promising innovation ideas?*

To empirically examine this research question, a global automotive firm provided a dataset with 314 supplier and startups ideas containing idea assessments and longitudinal information regarding the implementation of these ideas. Hence, we were able to draw on unique data and investigate our research question under real-world conditions in a naturalistic setting, which is similar to existing studies exploring the quality of innovation ideas (e.g., Björk & Magnusson, 2009; Lilien, Morrison, Searls, Sonnack, & Hippel, 2002). We used ordinary least squares (OLS) and binary logistic regression to investigate the differences in idea quality and implementation among supplier and startup ideas. In addition, we applied quantile regression for further analysis.

1.3.2. The organization of the search for startups

Search as a strategic task has been regarded from various angles within open innovation literature (Gavetti & Levinthal, 2000; Knudsen & Srikanth, 2014; Lopez-Vega, Tell, & Vanhaverbeke, 2016). Existing studies have investigated the identification of various external knowledge partners, e.g., applying competitions for suppliers in the early stages of firms' innovation processes (Langner & Seidel, 2009). In particular, scholars have so far focused on how corporations identify innovative partners within their supply base (Pulles et al., 2014; Schiele, 2006). Regarding the identification of new partners such as startups, the literature is limited to very specific approaches that focus on the establishment of external scouting units (Gassmann & Gaso, 2004; Monteiro & Birkinshaw, 2017). Yet, the literature misses a holistic analysis on how to identify innovative partners beyond established networks. Therefore, the following research question (RQ2) is introduced: *Which approaches do corporations apply to search for startups?*

To investigate this research question, we applied a multiple case study among eight automotive corporations. Following a key informant approach we interviewed 13 employees from innovation management, research and development (R&D), procurement, mergers and acquisitions (M&A), strategy, and corporate venture capital (CVC) (John & Reve, 1982). The data from the interviews were enriched by accessing publicly available materials, e.g., articles, Crunchbase, CB Insights and company websites. For the data analysis, we followed a structured approach that included: transcribing all interview data, coding, discussing codes with peers, and continuously reviewing of all interview transcripts and secondary data.



1.3.3. Search strategies for startups and the implications for the searching organization

All prior studies concerning the search for startups are qualitative and describe only selected search approaches (Homfeldt, Rese, Brenner, Baier, & Schäfer, 2017; Weiblen & Chesbrough, 2015). As an extension to study 2, the following part analyzes which search strategies are most successful for the identification of startups. Moreover, prior research points out that corporate organizations often under-invest in the realization of truly novel ideas (Henderson, 1993), because these mature organizations face inertia rooted in their organizational routines (Levinthal & March, 1993), structures (O'Connor & Rice, 2013), and mental models (Tripsas & Gavetti, 2000). By accessing knowledge from startups, firms aim at overcoming this myopia and increase their innovation performance (Wadhwa et al., 2016). Thereby, scholars have primarily focused on collaborations with startups in form of minority investments (Dushnitsky & Lenox, 2006) or joint development projects (Gassmann et al., 2010). No existing study has analyzed the effects of implementing structured search for startups, although the generation of new knowledge requires the integration of external stimuli (Zollo & Winter, 2002). This study proposes that the search for startups implies necessary external impulses to generate radical innovations and subsequently expands the firms' organizational capabilities. Hence, the third research question (RQ3) addresses both described gaps: *How do corporations achieve successful search for startups to enhance their organizational capabilities?*

To answer this research question and to test our hypotheses on a profound empirical basis, we surveyed a cross-industry sample by means of a self-administered internet-based survey. The final dataset consisted of 97 firms. We operationalized search strategy with the commonly applied constructs for search breadth and search depths (Laursen & Salter, 2006, 2014; Leiponen & Helfat, 2010). In contrary to analyzing knowledge sources, we examined the application of eleven search instruments (e.g., startup pitch events or databases). OLS and polynomial regression allowed to analyze the introduced model.

1.3.4. Corporations as attractive partners for startups

Prior research has neglected the perspective of firms providing external knowledge (Monteiro, Mol, & Birkinshaw, 2017; Rothaermel & Alexandre, 2009). Especially, the perspective of startups has not received sufficient attention yet (Alvarez & Barney, 2001; Katila et al., 2008). On the one hand, corporations can assist startups to overcome constraints concerning their liability of newness (Stuart, 2000; Stuart, Hoang, & Hybels, 1999) or missing technological capabilities (Andersson & Xiao, 2016; Mitchell & Singh, 1992). On the other hand, startups



may be confronted with risks, such as dependency or misappropriation of intellectual property (IP) (Diestre & Rajagopalan, 2012; Katila et al., 2008). Still, benefits and risks of corporate-startup collaborations have been considered only isolated and the literature lacks an analysis how entrepreneurs weight such factors when it comes to establishing their willingness to collaborate. Therefore, the fourth study regards the following research question (RQ4): *Which factors influence the willingness of startups to enter collaborations with corporations?*

Building on a sample of twelve startups, we were able to analyze 30 corporate-startup collaborations within our cases. The sample consists of startups with established relations to corporations and startups without experiences concerning collaborations. Further, the selected cases belong to different industries, e.g., information and communications technology (ICT) or manufacturing, and differ according to the development stage of their technology. To facilitate triangulation, we included both, interview and secondary data. All interviews were transcribed and coded. We followed a multiple-step approach to cluster and analyze our data, as proposed by Gioia, Corley, and Hamilton (2013).

1.4. Research outline and contributions

In sum, this dissertation consists of four articles that contribute to a better understanding of the pre-collaboration phase of relationships between startups and corporations. In doing so, we add primarily to literature on external knowledge sourcing. Starting with the perspective of corporations, chapter 2 examines the quality of startup ideas. The subsequent chapters deal with the search for startups and its implications on the searching organization. Finally, chapter 5 respects the perspective of startups by highlighting how corporations may evolve to attractive partners for startups. Figure 2 illustrates the structure of the present dissertation. The following paragraphs summarize the contributions per chapter.

Chapter 2 compares ideas from suppliers and startups, which were identified, evaluated, and followed up in the course of an open innovation initiative conducted within a large automotive manufacturer. The evaluation of the ideas contains the degree of novelty, customer benefit, and implementation. Therefore, this part of the dissertation adds new dimensions to the discourse on open innovation and external knowledge sourcing. Moreover, contributions to the growing stream of research focusing on external knowledge provided by startups can be made (Monteiro & Birkinshaw, 2017; Weiblen & Chesbrough, 2015). The findings shed light on the question if startups are more promising innovation partners than existing suppliers. Hence, we



answer the question whether it really matters for corporations to engage in collaborations with startups.

Chapter 3 focuses on the search for external knowledge, which has evolved to a major strategic task for corporations. More specifically, this part analyzes how corporations search for startups and therefore regards which organizational approaches and processes are installed as well as which search instruments corporations apply to support their search for startups. The findings of this study add to literature on external knowledge sourcing by illustrating how firms search for knowledge outside their networks. Thus, an important gap in literature can be addressed since prior studies have exclusively focused on the identification of innovative partners within existing networks (Pulles et al., 2014; Schiele, 2006). In addition, several organizational structures are identified that allow corporate organizations to realize boundary spanning to access knowledge provided by startups (Rosenkopf & Almeida, 2003; Rosenkopf & Nerkar, 2001).

Chapter 4 provides an analysis of search strategies for the successful identification of startups and highlights the effects of these search activities on the searching firms' organizational capabilities. As a first step, the effects of open search breadth and search depth on the success of search for startups are investigated. Similar approaches to measure search breadth and depth have been applied in open innovation literature before (Crisuolo et al., 2018; Laursen & Salter, 2006; Monteiro et al., 2017). Second, this study investigates whether the search for startups provides stimuli to enhance the searching firms' radical innovation capabilities and consequently the firms' organizational capabilities (Colombo et al., 2017; Zollo & Winter, 2002). It is further investigated if distant knowledge, which is inherent in startups, provides additional new variations of knowledge and explorative ideas to solve existing problems for corporations (Fleming & Sorenson, 2004; Katila & Ahuja, 2002; March, 1991). By showing that the discovery of promising startups and the assessment of their ideas provide creative stimuli for the sourcing organization, an important gap in literature regarding the effects of search on organizational capabilities is addressed (Colombo et al., 2017; O'Connor & De Martino, 2006; Zollo & Winter, 2002).

Chapter 5 illuminates the perspective of startups in corporate-startups relationships. In doing so, this part of the dissertation focuses the prospect of external knowledge providers, which has been underrepresented in prior research (Monteiro & Birkinshaw, 2017; Rothaermel & Alexandre, 2009). The study investigates how complementary assets provided by corporations as well as risks and relational characteristics influence startups' decisions on engaging in corporate-startup collaborations. To achieve a more differentiated perspective,



startups are distinguished by the maturity of their technology in early-stage and market-ready. This chapter follows the rising interest in research on collaborations between small firms and larger organizations and in particular on approaches to attract resources of a partnering firm (Street & Cameron, 2007; Yang, Zheng, & Zhao, 2014). Further, the findings illustrate paths to enhance the attractiveness of corporations as partners for startups, which has been previously studied in the field of buyer-supplier relationships (Pulles et al., 2016; Schiele, Veldman, & Hüttinger, 2011).

Figure 2: Structure of the dissertation

